

US EPA RECORDS CENTER REGION 5



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**TECHNICAL MEMORANDUM
SURFACE-AND GROUND-WATER MONITORING AT
AIR FORCE PLANT 85, COLUMBUS, OHIO**

3/24/97

Prepared for:

Aeronautical Systems Center/Environmental Management
Directorate Restoration Division
1801 Tenth Street, Suite 2
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Prepared by:

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975 West Third Avenue
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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AERONAUTICAL SYSTEMS CENTER (AFMC)
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

03 APR 1997

MEMORANDUM FOR OHIO EPA - CENTRAL DISTRICT OFFICE
DIVISION OF EMERGENCY & REMEDIAL RESPONSE
ATTN: MR. DANIEL TJOELKER
P.O. BOX 1049
COLUMBUS OH 43216-1049

FROM: ASC/EM(D)
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SUBJECT: Surface and Ground Water Investigation at Air Force Plant 85

1. The following is attached for your information and review under our Defense State Memorandum of Agreement: *Technical Memorandum, Surface and Ground Water Monitoring at Air Force Plant 85, Columbus, Ohio (US Geological Survey, 24 March 1997)*.
2. If you have any questions, please contact me at (937) 255-4151, extension 429.

A handwritten signature in black ink, appearing to read "Karl J. Kunas", is positioned above the printed name.

KARL J. KUNAS, P.E.
Environmental Engineer
Acquisition Environmental Management

Attachment:
Tech Memo, 24 Mar 97

cc:
USEPA Region V (N. Gowda)

EXECUTIVE SUMMARY

This document summarizes of nonvalidated soil, ground- and surface-water and bed material sampling data from the Surface- and Ground-Water Monitoring Program at Air Force Plant 85 (AFP 85).

Soil sampling and monitoring well installation was completed in a 20-day period from November 11, 1996, to December 6, 1996. Ground-water sampling was completed in 2 days on December 16 and 17, 1996. Bed-material and surface-water sampling was completed on December 10, 1996.

The analyte list for soil and bed material sampling was volatile organic compounds, semivolatile organic compounds, pesticides, PCB's, and total metals. Common anions and cyanide were added for surface-water and ground-water analyses.

Volatile organic compounds were detected in soil samples from 11 auger borings and 3 hand-auger sites. The principal analytes detected included 2-butanone (MEK) (0.078mg/kg) and toluene (0.010 mg/kg). Semivolatile organic compounds were detected in soil samples from 6 borings. Principal analytes detected included fluoranthene (0.79 mg/kg) and phenanthrene (0.46mg/kg). Pesticides and PCB's were detected in soil samples from 2 borings, at USB01 and USB11. Eleven metals were detected in all soil sampled: aluminium, barium, calcium, cobalt, chromium, copper, lead, magnesium, manganese, vanadium, and zinc. Other metals — beryllium, potassium, molybdenum, nickel, and lead — were found in more than 70 percent of the samples. Silver, sodium, thallium, antimony, and selenium were not detected in any sample.

Volatile organic compounds, semivolatile organic compounds, pesticides, and PCB's were not detected in any wells. Only 4 metals were detected in all of the wells sampled— barium, calcium, magnesium, and manganese. Iron was found in more than 70 percent of the wells sampled. Beryllium, cadmium, silver, cobalt, copper, nickel, antimony, selenium, vanadium, and thallium were not found in any wells. Other inorganic compounds that were found included fluoride, chloride, nitrate, and sulfate. Cyanide was selectively analyzed on 5 ground-water samples with no detections found.

Volatile organic compounds were detected in surface-water samples from 3 sites — MR04, MR05, and MR02. Semivolatile organic compounds were not detected in any surface-water samples. Pesticides and PCB's were not detected in any surface-water samples. Eleven metals were detected in all surface water sampled; barium, calcium, iron, magnesium, manganese, and sodium. Only zinc was found in more than 70 percent of the samples. Silver, arsenic, beryllium, cadmium, cobalt, chromium, copper, potassium, molybdenum, nickel, lead, vanadium, thallium, antimony, and selenium were not detected in any sample.

Volatile organic compounds were found in 2 bed-material samples. Toluene (0.15mg/kg) and 1,2-dichloroethane (0.0056 mg/kg) were detected. Of the semivolatiles found, the most common occurrences were of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene. Endosulfan sulfate (averaging 0.664 mg/kg) was the only pesticide detected in all of the bed-material samples. Pesticide detections of gamma-chlordane

(averaging 0.006mg/kg) and endrin ketone (averaging 0.227mg/kg) were found. Four other locations had detections of pesticides. Sixteen metals were found in all of the bed-material samples. Silver, sodium, antimony, selenium, and thallium were not detected in any sample.

INTRODUCTION

The purpose of the Surface-and Ground-Water Monitoring Program was to assess the effects of possible contamination, if any, at AFP 85. The investigative approach of the Surface-and Ground-Water Monitoring Program is to

1. define the hydrogeological framework, and the direction and rate of ground-water flow at AFP 85;
2. determine the source(s), nature, and extent of ground-water and surface-water contamination at AFP 85;
and
3. evaluate the steam/aquifer interaction with regard to future contamination problems

This Technical Memorandum contains summaries of the field effort and water-quality results by analytical method.

SAMPLING SUMMARY

Soil sampling and monitoring-well installation was completed in a 20-day period, from November 11, 1996 to December 6, 1996. Ground-water sampling was completed in 2 days on December 16 and 17, 1996. Bed-material and surface-water sampling was on December 10, 1996. Boring, surface-water, and well locations are illustrated in Figure 1 and listed in table 1.0.

Target analytes and analytical methods are summarized below.

Analyte group	Analytical method	Sample matrix
Volatile organic compounds by GC/MS	SW8260/8240	GW-SW-BM
Semivolatile organic compounds by GC/MS	SW8270	GW-SW-BM
Pesticides and PCB's	SW8080	GW-SW-BM
Metals	SSW6010	GW-SW-BM
Anions	E300.0	GW-SW
Cyanide	SW9012	SW-GW

A summary of results follows.

SOIL SAMPLING

Soil samples were collected at selected intervals during drilling at 14 sites and by hand at 2 separate sites.

Quanterra was sent 41 regular soil samples and 9 Quality Assurance/Quality Control (QA/QC) samples. The QA/QC sample breakdown follows:

- 1 Equipment blank
- 4 Trip blanks
- 1 Soil duplicates
- 1 Matrix spike
- 1 Matrix spike duplicate
- 1 Ambient blank

Field data were recorded in field books which are on file at the USGS Ohio District Office. Copies are available upon request.

GROUND-WATER SAMPLING

The Surface-and Ground-Water Monitoring Program ground-water sampling network is made up of 6 existing and 4 recently installed wells.

The sampling was completed in 2 days using two 2-person teams. All sampling, packing and shipping activities were completed by these two teams. Nineteen samples were shipped to Quanterra Incorporated Analytical Laboratory. Quanterra was sent 11

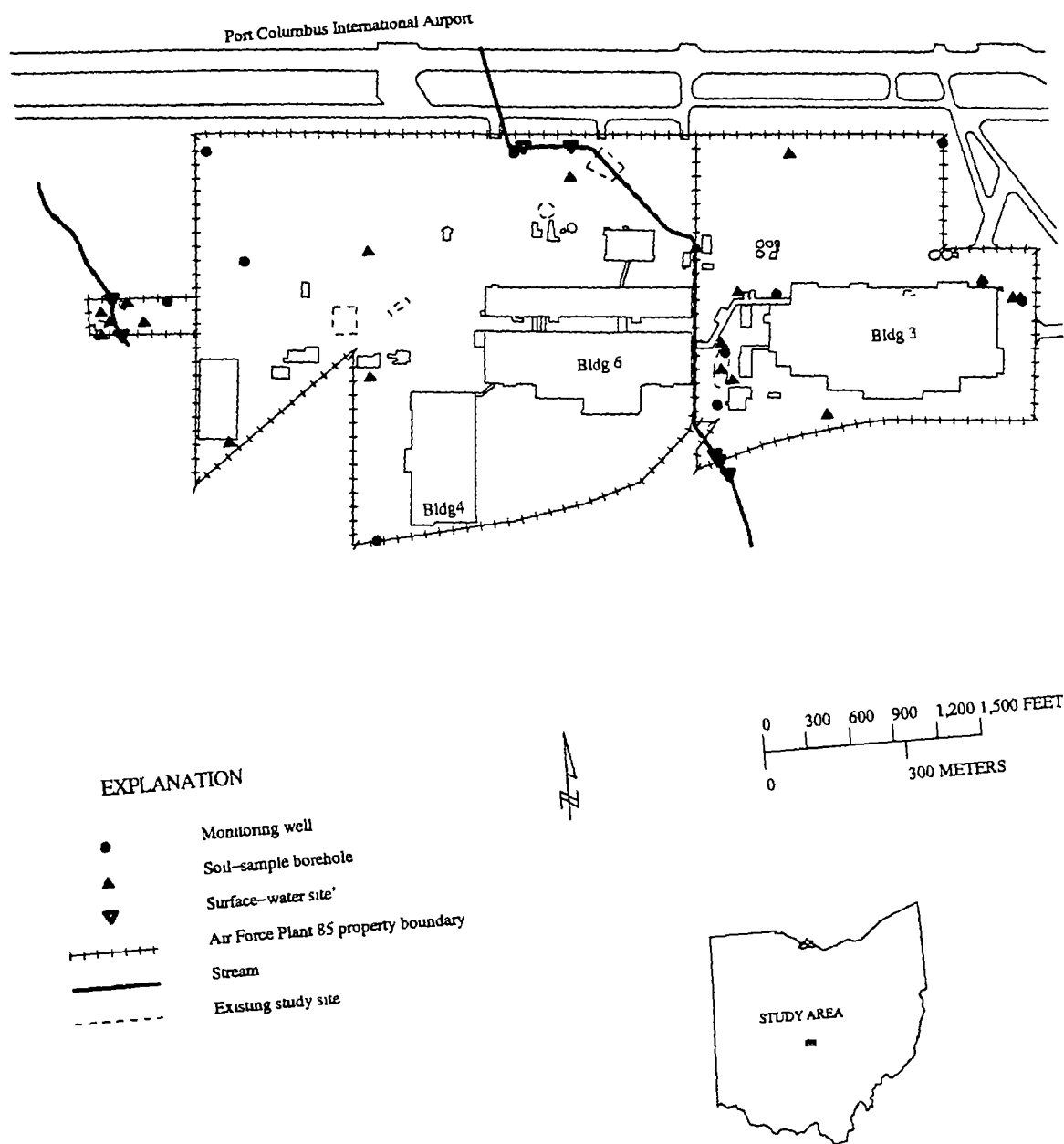


Figure 1.—Location of borings, ground-water-monitoring wells, and surface-water sites.

TABLE 1.0 - Location and site identification of boring, ground-water and surface-water sites

Locations		Site identification of soil boring	Site identification of ground-water sites	Site identification of surface-water sites
Magnesium Chip Burning Area		USB15		
		USB16	USW16	
		USB17		
Coal Pile Area		USB11		
		USB12		
		USB13	USW13	
		USB13A		
Rubble Disposal Area		USB180A		
		USB180B		
		USB180C		
Fuel Tank Area east of Bldg. 3		USB05	BLD3 (monitoring well)	
		USB06		
North boundary near 1st Street		USB09		
North central boundary area		USB01		
Wash Rack Area		USB10		
Stationary Radar Site		USB21		
North of Bldg. 3		USB07		

Locations		Site identification of soil boring	Site identification of ground-water sites	Site identification of surface-water sites
		USB08		
North of Bldg. 10		USB02	USW02	
South of Bldg. 124		USB20		
Areas				
South of Bldg. 125		USB04		
Parking Lot near Bldg 3		USB14		
North of Bldg. 40		USB03		
Leach Field area		USB19	USW19	
Northwest Perimeter Road			9MW1	
Northeast perimeter Road			9MW3	
Near Mason's Run			PG501	
Southwest Bldg 4 parking lot			9MW7	
Near collection pit near Coal Pile			PG201	
Turkey Run (upstream)				TR01
Turkey Run (downstream)				TR02
Mason's Run (northern boundary)				MR01
Mason's Run (northern boundary)				MR02

Locations		Site identification of soil boring	Site identification of ground-water sites	Site identification of surface-water sites
Mason's Run (at weir)				MR03
Mason's Run (north of 5th Ave)				MR04
Mason's Run (south of 5th Ave)				MR05

regular ground-water samples and 9 Quality Assurance/Quality Control (QA/QC) samples. The QA/QC sample breakdown follows:

- 1 Equipment blank
- 4 Trip blanks
- 2 Ground-water duplicates
- 1 Matrix spike
- 1 Matrix spike duplicate

Ground-water samples were collected using either a pumping system or a dedicated bailer. All field parameters except turbidity were measured in-line using a Hydrolab H2O. Field data were recorded in field books, which are on file at the USGS Ohio District Office. Copies are available upon request.

SURFACE-WATER and BED-MATERIAL SAMPLING

Surface-water and bed-material sampling was completed in 1 day on December 10, 1996 using two 2 person sampling teams. Seven surface-water and 7 bed-material samples and 8 Quality Assurance/Quality Control (QA/QC) samples were shipped to Quanterra. The QA/QC sample breakdown follows:

Surface Water

- 1 Duplicate
- 1 Matrix spike
- 1 Matrix spike duplicate

Bed Material

- 1 Trip blank
- 2 Duplicates
- 1 Matrix spike
- 1 Matrix spike duplicate

Field data sheets were recorded in field books on file at the USGS Ohio District Office. Copies are available upon request.

SOIL ANALYTICAL DATA

ORGANICS

Volatile Organic Compounds

Volatile organic compounds were detected in soil samples from 11 auger borings and 3 hand-auger sites. The principal analytes detected were 2-Butanone (MEK) and toluene.

Location	Analyte	Concentration (mg/kg)	Sample Depth (ft)
USB0202	PCE	0.0056	30
USB0202	Toluene	0 0069	30
USB0301	MEK	0.047	4
USB0501	Benzene	0.097	12
USB0501	Vinyl Chloride	0.014	12
USB0503	Benzene	0.0091	12
USB0503	Ethylbenzene	0 0051	12
USB0503	Xylenes	0 015	12
USB0602	Benzene	0 0088	9
USB0701	MEK	0.0055	4
USB0801	MEK	0.078	4
USB0901	MEK	0 037	2
USB1201	111-TCA	0 0099	5
USB1302	Toluene	0 041	14
USB1302	Xylenes	0 0054	14
USB1502	MEK	0 022	19
USB1502	Toluene	0 010	19
USB180A	MEK	0.065	2
USB180B	Toluene	0.0089	2
USB180C	Toluene	0.0088	2
USB1902	Toluene	0 0090	27

Semivolatile Organic Compounds

Semivolatile organic compounds were detected in soil samples from 6 borings. The non-qualified detections were from the following locations:

Location	Analyte	Concentration (mg/kg)	Sample Depth (ft)
USB0101	Phenanthrene	0.40	6
USB0101	Fluoranthene	0.79	6
USB0101	Pyrene	0.78	6
USB0101	Chrysene	0.37	6
USB0101	Benzo(k)fluoranthene	0.41	6
USB0503	2-Methylnaphthalene	0.61	12
USB0702	2-Methylnaphthalene	0.42	6.5
USB0702	Phenanthrene	0.40	6.5
USB0702	Pyrene	0.47	6.5
USB0702	Fluoranthene	0.46	6.5
USB0801	Naphthalene	0.99	4
USB0801	2-Methylnaphthalene	1.4	4
USB1901	bis(2-Ethylhexyl)phth-	0.35	2.5
USB2101	Fluoranthene	0.61	3
USB2101	Phenanthrene	0.46	3
USB2101	Pyrene	0.57	3

PESTICIDES AND PCB's

Pesticides and PCB's were detected in soil samples from 2 borings. The non-qualified detections were from the following locations:

Location	Analyte	Concentration (mg/kg)	Sample Depth (ft)
USB0101	4,4' -DDT	0.0034	6
USB0101	Endosulfan sulfate	0.022	6
USB1101	Aroclor 1254	0.056	2

INORGANICS

Metals, Total

Of the 23 metals included in the analyte list, 11 were detected in all soil sampled: aluminium, barium, calcium, cobalt, chromium, copper, lead, magnesium, manganese, vanadium, and zinc. Other metals — beryllium, potassium, molybdenum, nickel, and lead — were found in more than 70 percent of the samples. Silver, sodium, thallium, antimony, and selenium were not detected in any sample.

A list of total metals in soil is presented below.

Metal	# Samples Conc. Found	% Samples Conc Found	Avg. Conc., mg/kg
AG	0	0	0
AL	44	100	5958
AS	26	59	18.8
BA	44	100	145
BE	39	89	0.43
CA	44	100	80257
CD	1	2	0.73
CO	44	100	7 6
CR	44	100	8 9
CU	44	100	12.9
FE	44	100	17337
K	38	86	739
MG	44	100	24210
MN	44	100	292
MO	42	95	7.4
NA	0	0	0
NI	43	98	23.1
PB	31	70	15.9

Metal	# Samples Conc. Found	% Samples Conc. Found	Avg. Conc., mg/kg
SB	0	0	0
SE	0	0	0
TL	0	0	0
V	44	100	16.2
ZN	44	100	51.3

GROUND-WATER QUALITY DATA

ORGANICS

Volatile Organic Compounds

Volatile organic compounds were not detected in water from the 10 wells sampled.

Semivolatile Organic Compounds

Semivolatile organic compounds were not detected in any ground-water samples from the 10 wells:

PESTICIDES AND PCB's

Pesticides and PCB's were not detected in any ground-water samples.

INORGANICS

Metals, Total

Of the 23 metals included in the analyte list, 4 were detected in all wells sampled—barium, calcium, magnesium, and manganese. Iron was found in more than 70 percent of the wells sampled. Beryllium, cadmium, silver, cobalt, copper, nickel, antimony, selenium, vanadium, and thallium were not found in any wells.

A list of total metals in ground water is presented below.

Metal	# Wells Conc. Found	% Wells Conc. Found	Avg. Conc., mg/L
AG	0	0	0
AL	3	30	0.38
AS	0	0	0
BA	10	100	0.02
BE	0	0	0
CA	10	100	124
CD	1	10	0.0083
CO	0	0	0

Metal	# Wells Conc. Found	% Wells Conc. Found	Avg. Conc., mg/L
CR	1	10	1.4
CU	0	0	0
FE	9	90	2.13
K	1	10	18.1
MG	10	100	46.1
MN	10	100	0.08
MO	3	30	0.03
NA	5	50	22.4
NI	0	0	0
PB	2	2.3	2.2
SB	0	0	0
SE	0	0	0
TL	0	0	0
V	0	0	0
ZN	2	20	0.04

Anions, Ground Water

Water from wells were analyzed for 5 common anions.

Anion	# Wells Found	% Wells Found	Average Conc., mg/L
Fluoride	4	40	0.78
Chloride	10	100	20.6
Nitrate as N	1	10	5.8
Orthophosphate as P	0	0	0
Sulfate	10	100	161

Five ground-water samples were analyzed for cyanide with no detections found.

SURFACE-WATER QUALITY DATA

ORGANICS

Volatile Organic Compounds

VOCs were detected in surface-water samples from 3 sites.

Location	Analyte	Concentration (µg/L)
MR04	Chloroform	1.5
MR05	Chloroform	1.6
MR02	1,2-Dichloroethane	1.4
MR02	TCE	1.2

Semivolatile Organic Compounds

Semivolatile organic compounds were not detected in any surface-water samples.

PESTICIDES AND PCB's

Pesticides and PCB's were not detected in any surface-water samples.

INORGANICS

Of the 23 metals included in the analyte list, 11 were detected in all surface water sampled — barium, calcium, iron, magnesium, manganese, and sodium. Only zinc was found in more than 70 percent of the samples. Silver, arsenic, beryllium, cadmium, cobalt, chromium, copper, potassium, molybdenum, nickel, lead, vanadium, thallium, antimony, and selenium were not detected in any sample.

A list of total metals in surface water is presented below.

Metal	# Samples Found Conc.	% Samples Found Conc.	Avg. Conc., (mg/L)
AG	0	0	0
AL	4	57	0.15
AS	0	0	0
BA	7	100	0.09
BE	0	0	0
CA	7	100	106
CD	0	0	0
CO	0	0	0
CR	0	0	0
CU	0	0	0
FE	7	100	0.30
K	0	0	0
MG	7	100	28.6
MN	7	100	0.11
MO	0	0	0
NA	7	100	43
NI	0	0	0
PB	0	0	0
SB	0	0	0
SE	0	0	0
TL	0	0	0
V	0	0	0
ZN	5	71	0.04

Anions, Surface Water

Water from wells were analyzed for 5 common anions.

Anion	# Sample Found Conc	% Sample Found Conc.	Average Conc., mg/L
Fluoride	0	0	0
Chloride	7	100	79
Nitrate as N	7	100	16.6
Orthophosphate as P	4	57	0.13
Sulfate	7	100	74.8

Three surface-water samples were analyzed for cyanide; there was no detection in any sample.

BED-MATERIAL ANALYTICAL DATA

ORGANICS

Volatile Organic Compounds

Only 2 unqualified volatile organic compounds were found in bed-material samples.

Location	Analyte	Concentration (mg/kg)
MR03	1,2-Dichloroethane	0.0056
MR04	Toluene	0.15

Semivolatile Organic Compounds

The average concentrations of semivolatile organic compounds found in the bed material are listed below.

Analyte	Number of sites found	Avg. Concentration (mg/kg)
Fluoranthene	7	216
Pyrene	7	164
Benzo(a)anthracene	5	106
Benzo(b)fluoranthene	5	106
Benzo(k)fluoranthene	5	77.8
Benzo(a)pyrene	5	79.3
Phenanthrene	5	302
Chrysene	5	128
Benzo(g,h,i)perylene	4	42.1
Acenaphthene	2	72.5
Anthracene	2	117
Dibenzofuran	2	69.5
Fluorene	2	78
Dibenz(a,h)anthracene	1	2.0
Carbazole	1	85

PESTICIDES AND PCB's

Unqualified pesticide and PCB's detections are listed below.

Analyte	Number of Sites Found	Avg. Conc (mg/kg)
Aldrin	2	0.005
alpha-BHC	2	0.236
beta-BHC	1	0.002
4,4' -DDE	1	2 5
Endosulfan Sulfate	7	0.664
Endrin Ketone	4	0 227
gamma-Chlordane	3	0.006
alpha-Chlordane	1	0 014

INORGANICS

Metals, Total

Average concentrations of all metals are listed below.

Metal	Number of Sites Found	Avg. Conc (mg/kg)
AG	0	0
AL	7	3360
AS	3	13
BA	7	61 1
BE	7	0.29
CA	7	4196
CD	7	1.17
CO	7	4 84
CR	7	31.1
CU	7	33 4
FE	7	11963
K	2	534
MG	7	11761
MN	7	240

Metal	Number of Sites Found	Avg. Conc (mg/kg)
MO	7	4.28
NA	0	0
NI	7	15.0
PB	7	102.8
SB	0	0
SE	0	0
TL	0	0
V	7	10.5
ZN	7	297